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MATH 121--Calculus II

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Math 121 Calculus II

Spring 2016

Web page http://math.clarku.edu/~ma121

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Department of Mathematics and Computer Science

Clark University

General description from Clark's *Academic Catalog*

Math 120 and 121 (Calculus I and II) / Lecture

Calculus is essential for majors in biology, chemistry, computer science, mathematics, physics, and environmental science and policy. Part I includes functions, limits, continuity, differentiation of algebraic and trigonometric functions, mean value theorem, and various applications. Part II includes Riemann sums and integrals, techniques and applications of integration, improper integrals, transcendental functions (logarithms, exponential functions, and inverse trigonometric functions), sequences, and series. Though not all results are derived rigorously, care is taken to distinguish intuitive arguments from rigorous proofs. Math 120 and 121 each fulfill the Formal Analysis requirement.

Description for the course. This is the second course in a two-semester calculus sequence designed for students majoring in a field that requires the tools of calculus. Besides the computational aspects of calculus, we will develop the concepts of calculus with some rigor. Topics in Math 121 include techniques of integration, applications of integration, a short introduction to differential equations, sequences, series, and power series. See below for a detailed syllabus of the course. Prerequisite: Math 120, Math 124, or AP credit for a semester of calculus.

Goals. See goals for an outline of the course goals including knowledge, intellectual and practical skills, skepticism and the mathematical mind, and integrating knowledge and skills
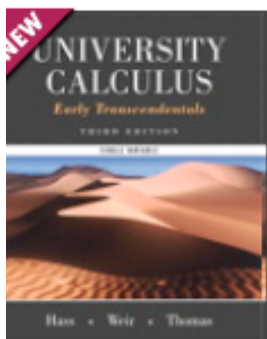
University Calculus, Early Transcendentals, Single Variable Plus MyMathLab -- Access Card Package, 3/E

Joel R. Hass, *University of California, Davis*
Maurice D. Weir, *Naval Postgraduate School*

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©2016 • Pearson • Cloth Bound with Access Card, 744 pp
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Suggested retail price: $147.40

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Textbook. Our text for this course and for Math 121 is *University Calculus, Early Transcendentals, Single Variable* by Hass and Weir, third edition. Note that you'll need the version that gives you access to MyMathLab. The book without access to MyMathLab is not enough.

This is the same book we used in Math 120. If you already have it, you don't need to purchase it again.

Accessing MyMathLab. To register for MyMathLab course online, you will need:

o   The Course ID. Different ID's for different sections.
o   An Access Code. This comes with the book that you purchased. (It can be purchased separately. Note also that there is an option to grant you temporary access to your course for 14 days even if you don't have an access code yet.) Keep a record of your purchase. You can use it after the end of the course to access the text.

To get precise registration instructions, go to MyMathLab, http://pearsonmylabandmastering.com, and, on the right, click on *Student* under *Register*. There you will give your course ID and follow the steps given. Be careful to put in your name precisely as it appears in the university records.

At the end of the registration process you will have a login name and password. Each time you want to access MyMathLab, click on *Sign in* (under *sign in*, and then put in your data. On the left of the resulting screen you will see *Math 121-...*. Click on that.

On the web page that comes up you'll see buttons on the left that are used to give the various options of the software. From here you can do an assignment, take a test, etc. There's a button *Study Plan*, which allows you to practice problem solving, with help from the program if requested. You also have a *Multimedia Library* which contains useful material.

By the way, you can access MyMathLab from any computer on the internet. There are computers in Goddard Library if you don't have one or if yours breaks down.

As a final note, remember that aside from online support, Pearson offers tech support for MyMathLab, so you can call them if anything goes wrong. The Pearson 24/7 Technical Support web page is at http://247pearsoned.custhelp.com/. (In the past the web site has sometimes been down for short periods of time, but it came back up fairly quickly.)

Concerning calculators. You won't need one beyond the scientific calculator that's available on every computer, and that won't be needed except on a few homework exercises that ask for decimal answers. Calculators won't be allowed during tests, and they're not needed on the tests.

Assignments.

The course will use the software MyMathLab for the homework assignments. It will also be employed to practice problem solving. To start using it, you must register to your section online at http://pearsonmylabandmastering.com/ using the Course ID given to you by your instructor and your access code.

If you get an exercise wrong, you'll be able to try it a second time. If you're ill or otherwise need an extension, that can be arranged. Otherwise, late exercises will by reduced by 25%, and they'll only be available for a few days after the due date.

The assignments are all on line, but if for any reason you can't access them, here's a corresponding list of exercises from the text. They'll be assigned as the course progresses.

Some of the questions on the assignments will ask you for numerical answers. A standard scientific calculator has everything you need. The one on a computer that's sufficient for that.

Tests and final exam There will be two tests during the semester and a final examination during finals week. The final is cumulative, but post-midterm material will be emphasized. The tests are closed book, no calculators, and no notes allowed. You can leave your answers in terms as algebraic expressions on tests. There may also be short in-class quizzes given periodically throughout the semester.

- First test: February, date to be determined, on chapters 5 and 6
- Second test: March, date to be determined, on chapters 7 and 8
- Final exam: There will be two times selected during finals week. You may take your final on either, your choice

Course grade The course grade will be based on 20% for homework assignments and quizzes, 25% for each of the two midterms, and 30% for the final.

General policies

Class attendance and class participation are obligatory. During the class meetings the text will be supplemented with more rigorous theory and special topics. Turn off your cell phones during class. Laptops may only be used for class-related purposes—no texting, no browsing, no email.

Calculators, cell phones, and laptops may not be used during tests.

Clark University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you have or think you have a disability and require academic accommodations, you must register with Student Accessibility Services (SAS), which is located in room 430 on the fourth floor of the Goddard Library. If you have questions about the process, please contact The Director of Student Accessibility Services at (508)798-4368. If you are registered with SAS, and qualify for accommodations that you would like to utilize in this course, please request those accommodations through SAS in a timely manner.

Time and study

Besides the time for classes, you'll spend time on reading the text, doing the assignments, and studying of for quizzes and tests. That comes to about five to nine hours outside of class on average per week, the actual amount varying from week to week

Tutoring/mentoring. If you're having any difficulties in the course, there are several tutors available for you to help with the course.

There will be about 8 upperclass students who you may contact to set up one or more tutoring lessons. Their names and email addresses will be sent to you by email. They will have walk-in help hours Thursday evenings 8 pm to 10 pm in BioPhysics room BP 326, and you can contact them individually for hours as well. If you would like meet one for tutoring, either for one session or for regular repeated sessions, contact him or her and set up a meeting time. There is no cost to you either for the walk-in help or individual help as they're paid by the department.

Syllabus. Some of the listed topics are optional.

We've already covered sections 5.1 through 5.4 in Math 120, Calculus I, so we'll only review them briefly at the beginning of the course. There will be, however, short homework assignments from sections 5.3 and 5.4.

Chapter 5. **Introduction to integration.**
• 5.1. Area and estimating with finite sums
• 5.2. Sigma notation and limits of finite sums
Fermat computes an integral
• 5.3. The definite integral

The origin of the FTC
Definition of integrals Summary of foundations of integration
Exercises: 21, 29, 31, 41, 51, 57, 59, 79.
• 5.4. The fundamental theorem of calculus. FTC
Antiderivatives
Proofs of FTC–1 and FTC
Exercises: 3, 13, 19, 22, 23, 31, 35, 75, 81.
• 5.5. Indefinite integrals and the substitution method
Substitution for integrals
Exercises: 1, 3, 4, 7, 9, 11, 17, 18, 19, 21, 22, 27, 29, 47, 55, 69.
• 5.6. Substitution and area between curves
Exercises: 2, 5, 7, 11, 15, 19, 21, 27, 29, 39.
More exercises: 47, 51, 53, 54, 55, 57, 63, 65, 97, 113.

Chapter 6. Applications of definite integrals.
• 6.1. Volumes using cross-sections and solids of revolution. See also notes on volumes and notes on volumes of solids of revolution at Selwyn Hollis' Video Calculus
Exercises: 1, 9, 13, 17, 19, 23, 25, 37, 39.
• 6.2. Optional topic: Volumes using cylindrical shells
• 6.3. Arc length
Exercises: 1, 2, 3, 5, 26, 29
• 6.4. Areas of surfaces of revolution
Exercises: 9, 13, 15, 21, 28, 29
• Optional topic: Continuous probabilities part I and part II

Chapter 7. Integrals and transcendental functions.
• 7.1. The logarithm defined as an integral
Exercises: 1, 3, 5, 9, 10, 19, 27, 31
• 7.2. Exponential change and separable differential equations
Exercises: 3, 5, 9, 11, 17
More exercises: 25, 31, 33, 39, 43, 44

Chapter 8. Techniques of integration.
• 8.1. Integration by parts
Rules and methods of integration
Exercises: 4, 5, 7, 8, 11, 21, 29, 33
• 8.2. Trigonometric integrals
See also Dave's Short Trig Course at http://www.clarku.edu/~djoyce/trig
Exercises: 3, 5, 33
• 8.3. Trigonometric Substitutions
Exercises: 15, 17, 19, 21
• 8.4. Integration of rational functions by partial fractions
The Method of Partial Fractions to Integrate Rational Functions
Summary on integration
The Logistic population model
Exercises: 1, 6, 10, 11, 17, 22

• 8.7. Improper integrals
Exercises: 1, 2, 7, 10, 21, 25, 65

Chapter 9. Infinite sequences and series.
• Survey of sequences and series
• 9.1. Infinite sequences
Summary of limits of sequences
On the limit $(1 + 1/n)n \to e$ at http://math.clarku.edu/~ma121/elimit.pdf
Exercises: 3, 13, 15, 27, 31, 35, 37, 41, 53, 65
• 9.2. Infinite series
Exercises: 1, 3, 17, 19, 21, 31, 61, 63, 88, 94
• 9.3. The integral test for convergence
Exercises: 3, 4, 6, 13, 15, 19, 21, 25, 35
• 9.4. Comparison tests for convergence
Exercises: 1, 9, 15, 21, 25, 31, 34, 37
• 9.5. Various tests for convergence for series with positive terms
Exercises: 5, 7, 9, 17, 18, 25, 31
• 9.6. Alternating series, Absolute and conditional convergence, Leibniz' alternating series test
Exercises: 3, 5, 7, 15, 21, 31
• 9.7. Power series, interval and radius of convergence
Exercises: 1, 3, 5, 7, 15, 25
• 9.8. Taylor's formula for the nth coefficient in a power series
Exercises: 1, 4, 11, 15, 25, 32

There's more information on the course web page
http://math.clarku.edu/~ma121